4 A, 600 V, Ultrafast Diode

The RURD460, RURD460S is an ultrafast diode with low forward voltage drop. This device is intended for use as freewheeling and clamping diodes in a variety of switching power supplies and other power switching applications. It is specially suited for use in switching power supplies and industrial application.

Features

- Ultrafast Recovery \( t_r = 60 \text{ ns} (@I_F = 4 \text{ A}) \)
- Max Forward Voltage, \( V_F = 1.5 \text{ V} (@ T_C = 25^\circ \text{C}) \)
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- RoHS Compliant

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Ordering Information

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PACKAGE</th>
<th>BRAND</th>
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<tr>
<td>RURD460</td>
<td>TO-251-2L</td>
<td>RUR460</td>
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<tr>
<td>RURD460S</td>
<td>TO-252-3L</td>
<td>RUR460</td>
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</table>

NOTE: When ordering, use the entire part number. Add suffix 9A to obtain the TO-252 variant in tape and reel, i.e., RURD460S9A.

Symbol

Absolute Maximum Ratings \( T_C = 25^\circ \text{C}, \text{Unless Otherwise Specified} \)

- Peak Repetitive Reverse Voltage \( V_{RRM} \)
- Working Peak Reverse Voltage \( V_{RWM} \)
- DC Blocking Voltage \( V_R \)
- Average Rectified Forward Current \( I_{F(AV)} \) \( (T_C = 160^\circ \text{C}) \)
- Repetitive Peak Surge Current \( I_{FRM} \) \( \text{(Square Wave, 20 kHz)} \)
- Nonrepetitive Peak Surge Current \( I_{FSM} \) \( \text{(Halfwave, 1 phase, 60 Hz)} \)
- Maximum Power Dissipation \( P_D \)
- Avalanche Energy (See Figures 9 and 10) \( E_{AVL} \)
- Operating and Storage Temperature \( T_{STG}, T_J \)
- Maximum Lead Temperature for Soldering Leads at 0.063 in. (1.6mm) from case for 10s \( T_L \)
- Package Body for 10s, see Tech Brief 334 \( T_{PKG} \)

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RURD460, RURD460S Rev. C1

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### Electrical Specifications  \( T_C = 25^\circ C, \text{ Unless Otherwise Specified} \)

<table>
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<tr>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
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<tr>
<td>( V_F )</td>
<td>( I_F = 4 \ A )</td>
<td>-</td>
<td>-</td>
<td>1.5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>( I_F = 4 \ A, \ T_C = 150^\circ C )</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>V</td>
</tr>
<tr>
<td>( I_R )</td>
<td>( V_R = 600 \ V )</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>( \mu A )</td>
</tr>
<tr>
<td></td>
<td>( V_R = 600 \ V, \ T_C = 150^\circ C )</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>( \mu A )</td>
</tr>
<tr>
<td>( t_{rr} )</td>
<td>( I_F = 1 \ A, \ dl_F/dt = 100 \ A/\mu s )</td>
<td>-</td>
<td>-</td>
<td>55</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>( I_F = 4 \ A, \ dl_F/dt = 100 \ A/\mu s )</td>
<td>-</td>
<td>-</td>
<td>60</td>
<td>ns</td>
</tr>
<tr>
<td>( t_a )</td>
<td>( I_F = 4 \ A, \ dl_F/dt = 100 \ A/\mu s )</td>
<td>-</td>
<td>32</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_b )</td>
<td>( I_F = 4 \ A, \ dl_F/dt = 100 \ A/\mu s )</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( Q_{rr} )</td>
<td>( I_F = 4 \ A, \ dl_F/dt = 100 \ A/\mu s )</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>nC</td>
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<tr>
<td>( C_J )</td>
<td>( V_R = 10 \ V, \ I_F = 0 \ A )</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>pF</td>
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<tr>
<td>( R_{thJC} )</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>( ^\circ C/W )</td>
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### Definitions

- \( V_F \) = Instantaneous forward voltage \((pw = 300 \mu s, D = 2\%)\).
- \( I_R \) = Instantaneous reverse current.
- \( T_{rr} \) = Reverse recovery time (See Figure 8), summation of \( t_a + t_b \).
- \( t_a \) = Time to reach peak reverse current (See Figure 8).
- \( t_b \) = Time from peak \( I_{RM} \) to projected zero crossing of \( I_{RM} \) based on a straight line from peak \( I_{RM} \) through 25% of \( I_{RM} \) (See Figure 8).
- \( Q_{rr} \) = Reverse recovery time.
- \( C_J \) = Junction capacitance.
- \( R_{thJC} \) = Thermal resistance junction to case.
- \( pw \) = Pulse width.
- \( D \) = Duty cycle.

### Typical Performance Curves

**FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE**

**FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE**
Typical Performance Curves (Continued)

FIGURE 3. $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

FIGURE 4. $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

FIGURE 5. $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

FIGURE 6. CURRENT DERATING CURVE

Test Circuits and Waveforms

FIGURE 7. $t_{rr}$ TEST CIRCUIT

FIGURE 8. $t_{rr}$ WAVEFORMS AND DEFINITIONS
Test Circuits and Waveforms  (Continued)

I = 1A  
L = 20mH  
R < 0.1Ω  
$E_{AVL} = \frac{1}{2}LI^2 \left(\frac{VR(ABL)}{VR(ABL) - VDD}\right)$  
Q1 = IGBT ($BV_{CES} > DUT \times VR(ABL)$)

**FIGURE 9. AVALANCHE ENERGY TEST CIRCUIT**

**FIGURE 10. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS**
Mechanical Dimensions

![Figure 9. TO-252 3L (DPAK) - TO252 (D-PAK), MOLDED, 3 LEAD, OPTION AA&AB](image)

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<th>Definition</th>
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